Feb. 7, 2005 – TES and HIRDLS coordination; sun run

Flight plan:

The plan is to fly along the TES nadir track northwest starting from the southeastern tip of Newfoundland (hopefully with clear-skies), then fly south along the HIRDLS track, followed by a short sun run. Both satellite runs are coordinated with Aura overpasses. Forecasts call for anomalously cold stratospheric temperatures at relatively high altitudes (22-25 km), so PSCs along the flight track are possible.

The estimated duration is 8:40.

Report:

Takeoff was approximately on time (13:27:01 UT). As we ascended to 33 kft, we entered a cirrus deck with moderate turbulence. COBALT had problems early on, but recovered by about 14:00 UT. Ascending to 35 Kft, we passed through a cirrus layer with low ozone concentrations.

As we started the TES run, we unfortunately had patchy boundary-layer clouds below the aircraft. Flying north along the coast of Newfoundland at 37 kft, there were stretches with no clouds below, and eventually we flew below high cirrus (13-km tops) and thick clouds below. Just before waypoint 8, we were forced down to 36 kft by ATC, resulting in cirrus above that prevented DIAL ozone retrievals. As we approached waypoint 9, the tropopause dropped below the aircraft, and the lower clouds cleared as well. Between waypoints 9 and 10, the column was clear except for intermittent boundary-layer cumulus clouds.

As we headed west to pick up the HIRDLS track, AROTAL indicated a distinct minimum in ozone at around 17–21 km with concentrations as low as about 1.7 ppmv near 20 km. On the northern sections of the TES and HIRDLS legs, there was a great deal of small-scale structure in the lower stratospheric ozone concentration (see figure below). The upper troposphere was clear throughout the HIRDLS leg.

FTS collected spectra during the $\simeq$40-minute southbound sun run. We appeared to be just above the thick cirrus deck below. Eventually, we were skimming the tops of the optically thin cirrus clouds. Much of the time in the cloud at about 203 K, the ice relative humidity hovered within a few percent of 100%. DACOM reported numerous sharp spikes in tracers, suggesting that we were flying right along a sharp tropopause.

Only very faint PSCs around 15 km were observed on the flight.

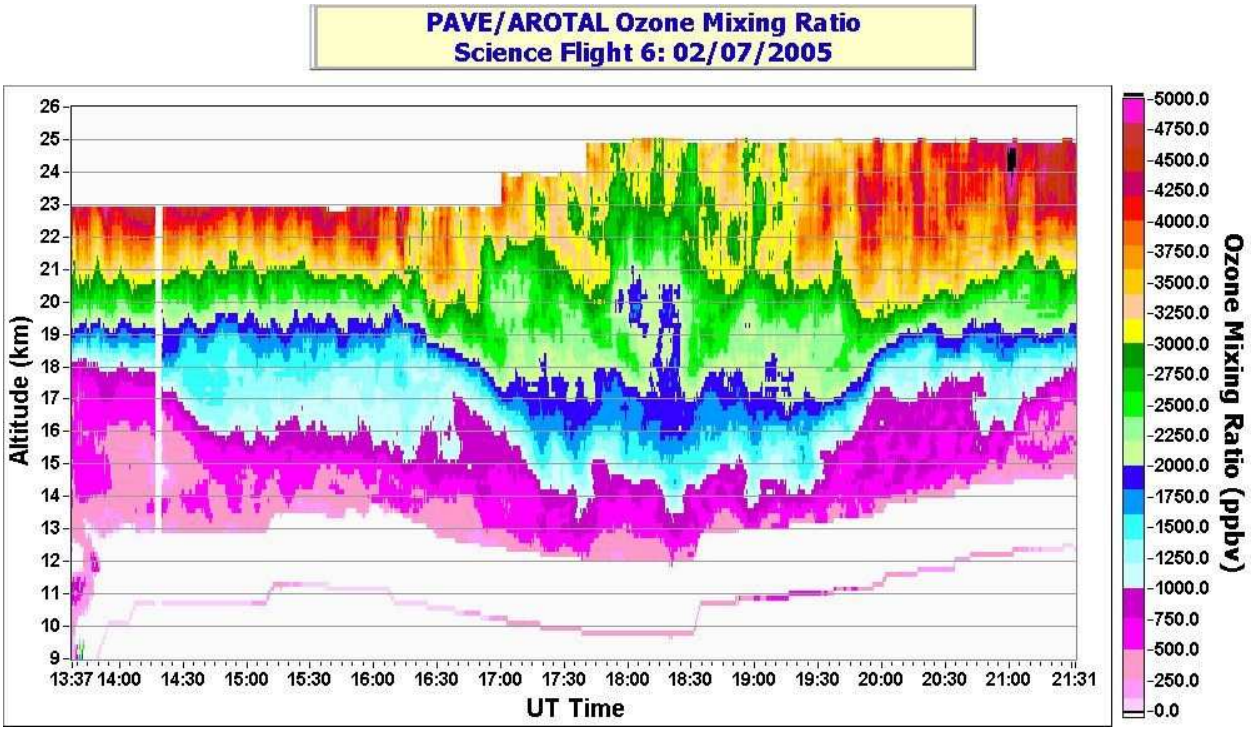

Figure 1: AROTAL curtain plot showing ozone variability at the edge of the vortex.

Instrument status:

- AROTAL: McGee–good flight, lots of ozone structure, low ozone concentrations in vortex collar
- DIAL: Browell–good flight, interesting low ozone features near the surface
- FTS: Coffey–good sun run, not affected by cirrus
- CAFS: Shetter–apparently fine
- MTP: Mahoney–good flight, coefficients need work
- ASUR: Notholt–worked well
- nadir CO_2: Heaps–good flight, useful glint measurements
- FastOz: Avery–good flight, interesting structure
- DACOM: Diskin–great flight, interesting microstructure at tropopause
- DLH: Diskin–good flight
- SAGA: Dibb–worked well, $<$ 2 ppbv HNO_3, $<$ 1 ppbv at 41 kft
- BNOD: Cohen–good flight
- ICATS: Hang–no problems
- COBALT: Podolske–worked flawlessly after problems early in flight